

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No.:

Group Art Unit:

Inventors: Arman et al.

Filed: Concurrently

Title: Method For Operating
A Cryocooler Using Temperature
Trending Monitoring

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

In accordance with 37 CFR 1.51, 1.56 and 1.97 to 1.99, the following is a relevance statement on each citation listed on attached form PTO-1449, and is made of record to assist the Patent & Trademark Office in its examination of this application:

U.S. 5,113,663 – Gifford discloses a multi-stage cryogenic refrigerator utilizing the Gifford-McMahon cycle which has an external regenerator in each stage. There is no disclosure of a method for operating a cryocooler wherein temperature trending of at least one cryocooler component or the refrigeration load is monitored and used to calculate a service time, and thus this reference neither discloses nor suggests applicants' claimed invention.

U.S. 5,398,512 – Inaguchi et al. discloses a cold accumulation type refrigerating machine wherein rotation output of a stepping motor is converted to a reciprocative motion of a displacement member carrying a cold accumulator and disposed within a cylinder. There is no disclosure of a method for operating a cryocooler wherein temperature trending of at least one cryocooler component or the refrigeration load is monitored and used to calculate a service time, and thus this reference neither discloses nor suggests applicants' claimed invention.

U.S. 6,378,312 – Wang discloses a component for use in a pulse tube cryorefrigerator which integrates the reservoirs or buffer volumes as well as the housing for the rotary valve, valve plate and drive motor. There is no disclosure of a method for operating a cryocooler wherein temperature trending of at least one cryocooler component or the refrigeration load is monitored and used to calculate a service time, and thus this reference neither discloses nor suggests applicants' claimed invention.

U.S. 6,374,617 – Bonaquist et al. discloses a pulse tube system wherein a product fluid such as hydrogen is preferably precooled and then liquefied, subcooled and/or densified by heat exchange with ultra cold gas generated by a pulsing compression wave which rejects heat into a cryogen fluid heat sink. There is no disclosure of a method for operating a cryocooler wherein temperature trending of at least one cryocooler component or the refrigeration load is monitored and used to calculate a service time, and thus this reference neither discloses nor suggests applicants' claimed invention.

U.S. 6,640,553 – Kotsubo et al. discloses a pulse tube refrigeration system having a pulse generator, a regenerator and a pulse tube, comprising a tapered work transfer tube interposed between the pulse generator and the regenerator. There is no disclosure of a method for operating a cryocooler wherein temperature trending of at least one cryocooler component or the refrigeration load is monitored and used to calculate a service time, and thus this reference neither discloses nor suggests applicants' claimed invention.

U.S. 6,544,038 – Acharya et al. discloses a pulse tube refrigeration system wherein the pulse tube working gas is cooled to a defined first stage temperature and is brought to a defined second state temperature by operation of a regenerator and pulse tube, which are in flow communication through a cold heat exchanger, prior to providing refrigeration to a high temperature superconduction. There is no disclosure of a method for operating a cryocooler wherein temperature trending of at least one cryocooler component or the refrigeration load is monitored and used to calculate a service time, and thus this reference neither discloses nor suggests applicants' claimed invention.

U.S. 6,604,363 – Corey et al. discloses a method for matching an acoustic load with an acoustic driver in a resonant acoustic system wherein a matching volume is positioned between the acoustic driver and load that is substantially greater than a stroke volume of the driver. There is no disclosure of a method for operating a cryocooler wherein temperature trending of at least one cryocooler component or the refrigeration load is monitored and used to calculate a service time, and thus this reference neither discloses nor suggests applicants' claimed invention.


Advanced Cryocooler Cooling For MRI Systems – Ackermann et al. describes the impact that certain cryocooler developments have had on MRI systems. There is no disclosure of a method for operating a cryocooler wherein temperature trending of at least one cryocooler component or the refrigeration load is monitored and used to calculate a service time, and thus this reference neither discloses nor suggests applicants' claimed invention.

Space Cryocooler Contamination Lessons Learned And Recommended Control Procedures – Castles et al. describes cryocooler contamination and subsequent degradation and failure mechanisms. There is no disclosure of a method for operating a cryocooler wherein temperature trending of at least one cryocooler component or the refrigeration load is monitored and used to calculate a service time, and thus this reference neither discloses nor suggests applicants' claimed invention.

Cryogenic Refrigerator Evaluation For Medical And Rotating Machine Applications – Ackermann et al. describes an evaluation performed after an apparent failure of a large number of refurbished cryocoolers. There is no disclosure of a method for operating a cryocooler wherein temperature trending of at least one cryocooler component or the refrigeration load is monitored and used to calculate a service time, and thus this reference neither discloses nor suggests applicants' claimed invention.

A copy of each of the non-patent citations is enclosed herewith.

Respectfully submitted,



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Form PTO-1449 (Rev. 8-83)		U.S. Department of Commerce						Atty. Docket No. D-21397				Serial No.					
Information Disclosure Citation (Use several sheets if necessary)										Applicants Arman et al.							
										Filing Date				Group			
U.S. PATENT DOCUMENTS																	
Examiner Initial		Document Number							Date	Name	Class	Subclass	Filing Date if Appropriate				
		5	1	1	3	6	6	3	5/1992	Gifford	62	6					
		5	3	9	8	5	1	2	3/1995	Inaguchi et al.	62	6					
		6	3	7	4	6	1	7	4/2002	Bonaquist et al.	62	6					
		6	3	7	8	3	1	2	4/2002	Wang	62	6					
		6	6	0	4	3	6	3	8/2003	Corey et al.	62	6	4-19-02				
		6	6	4	0	5	5	3	11/2003	Kotsubo et al.	62	6	11-20-02				
		6	6	4	4	0	3	8	11/2003	Acharya et al.	62	6	11-22-02				
FOREIGN PATENT DOCUMENTS																	
		Document Number							Date	Country	Class	Subclass	Translation Yes No				
Other Documents (including Author, Title, Date, Pertinent Pages, Etc.)																	
		Ackermann et al., "Advanced Cryocooler Cooling for MRI Systems", Cryocoolers 10 (1999) pp 857-867															
		Castles et al., "Space Cryocooler Contamination Lessons Learned and Recommended Control Procedures", Cryocoolers 11 (2001) pp 649-657															
		Ackermann et al., "Cryogenic Refrigerator Evaluation for Medical and Rotating Machine Applications", Cryocoolers 12 (2003) pp 805-811															
Examiner										Date Considered							
* EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.																	